**Calorimetry calculations**

***In your exam you will be provided with the SHC (Specific Heat Capacity) if needed:*** *specific heat capacity of water = 4.18 J g–1 °C–1*1)

**1)** **i)** When 25.0 mL of a 1.00 mol L–1 hydrochloric acid solution, HCl, is added to 25.0 mL of a 1.00 mol L–1 ammonia solution, NH3, a temperature rise of

6.50°C is recorded, as a neutralisation reaction occurs to produce aqueous ammonium chloride and water.

Calculate Δr *H* ° for this neutralisation reaction. The mass of the mixture is 50.0 g.   
Assume specific heat capacity of the aqueous ammonium chloride = 4.18 J g–1 °C–1

**ii)** When the Δr *H* ° for the neutralisation above was found experimentally in a school laboratory, the value obtained was lower than the theoretical value.   
Account for the difference in values, and suggest how this difference could be minimised.

**2)** The Δc *H* ° of propene was found experimentally in a school laboratory to be –1 368 kJ mol–1.

The theoretical value is –2 058 kJ mol–1. Account for the difference in values, and suggest how this difference could be minimised.

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| http://chemicalminds.wikispaces.com/file/view/l2bond2009calor.jpg/368908202/326x254/l2bond2009calor.jpg | ****3)**** The apparatus below was used to determine the enthalpy of combustion of hexane. When 0.400 g of hexane was burned in the spirit burner, the temperature of 150 g of water was found to increase from 22°C to 39°C.i) Calculate the experimental value of Δc*H* (C6H14, *ℓ*). ii) Account for the difference between the experimental value and the value given in a data book as  (- 4163kJmol-1) AND suggest how this difference could be minimised. |

#### 4) Dissolving of ammonium nitrate in water is an endothermic process.

#### NH4NO3(s) → NH4+(aq) + NO3–(aq)

#### When 1.80 g of ammonium nitrate was dissolved in 50.0 g of water, the temperature decreased by 2.70°C.

#### i) Calculate the enthalpy change when one mole of ammonium nitrate dissolves completely in water.

#### ii) Calculate the mass of ammonium nitrate that would be required to absorb 1.25 kJ of energy.

#### 5)

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| http://chemicalminds.wikispaces.com/file/view/l2bond2004calor.jpg/368908604/282x242/l2bond2004calor.jpg | i) The diagram below shows a simple calorimeter. It can be used to measure the enthalpy of combustion of ethanol, C2H5OH. If 1.00 g of ethanol is burned in the spirit burner, the temperature of the 200 g of water is found to increase from 22°C to 40°C. Using these results, calculate the experimental value of ∆cH (C2H5OH, l).ii) Give two reasons why the experimental value for the enthalpy of combustion of ethanol calculated above is so much less than the ‘accepted’ value in data books |

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